To: T10 Technical Committee
From: Rob Elliott, HP (elliott@hp.com)
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Subject: 03-215r0 SES-2 Array Control and Array Status diagnostic page changes

Revision history
Revision 0 (15 July 2003) First revision

Related documents
ses2r03 - SCSI Enclosure Services - 2 revision 3

Overview
In SCSI Enclosure Services - 2 (SES-2), the Enclosure Control/Enclosure Status diagnostic pages and the Array Control/Array Status diagnostic pages each support Device elements. The Array diagnostic page versions are supersets of the Enclosure diagnostic page versions. When they have shared fields, they are supposed to be functionally ORed together.

This is a rather awkward way to support a few additional bits.

This proposal:

1) Obsoletes the Array Control and Array Status diagnostic pages. Use the Enclosure Control/Status diagnostic pages exclusively.
2) Changes the Device element format for the Array diagnostic pages into a new Array Device element which is accessible through the Enclosure Control/Status diagnostic pages. Either the current Device element or the Array Device element may be used depending on whether the extra bits are needed.

Unique bits in the Array Control version of the Device element: Rqst R/R Abort, Rqst Rebuilt/Remap, Rqst In Failed Array, Rqst In Crit Array, Rqst Cons Check, Rqst Hot Spare, Rqst Rsvd Device

Unique bits in the Array Status version of the Device element: R/R Abort, Rebuilt/Remap, In Failed Array, In Crit Array, Cons Check, Hot Spare, Rsvd Device

Suggested changes

6 Parameters for enclosure services devices

6.1 Diagnostic parameters

6.1.1 Diagnostic parameters overview

Table 2 — Diagnostic page codes for enclosure service devices

~~06h, Array Control diagnostic page, Control, 6.1.10~~

~~06h, Array Status diagnostic page, Status, 6.1.11~~

6.1.2 Configuration diagnostic page

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The TYPE DESCRIPTOR HEADER field indicates the element type being described, the number of such elements, and the length of an optional text describing the element type. The format of the TYPE DESCRIPTOR HEADER is shown in table 5. The elements of an enclosure shall be listed in the same order in:

a) the Configuration diagnostic page;

b) the type descriptor text of the Configuration diagnostic page;

c) the Enclosure Control and Enclosure Status~~ and Array Status~~ diagnostic page~~s~~;

~~d) the Enclosure Control and Array Control diagnostic pages; and~~

e) the Threshold In and Threshold Out diagnostic pages.

Elements shall be listed in this order, regardless of SUB-ENCLOSURE IDENTIFIER:

1) All those elements defining SCSI devices; and

2) Elements of of other types.

Type descriptor headers for elements other than Device elements and Array Device elements may be listed in any order in the Configuration diagnostic page. The type descriptor text strings shall be placed after all type descriptor headers.

6.1.4 Enclosure Status diagnostic page

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The noncritical condition bit (NON-CRIT) shall be set to one if one or more noncritical conditions (see 3.1.26) have been detected or set in the enclosure. The NON-CRIT bit shall be cleared when both the following conditions are met:

a) all noncritical conditions have been corrected in the enclosure; and

b) the application client has cleared any NON-CRIT bit state that has been set using the Enclosure Control diagnostic page ~~or the Array Control diagnostic page~~.

The critical condition bit (CRIT) shall be set to one if one or more critical conditions (see 3.1.8) have been detected or set in the enclosure. The CRIT bit shall be cleared when both the following conditions are met:

a) all critical conditions have been corrected in the enclosure; and

b) the application client has cleared any CRIT bit state that has been set using the Enclosure Control diagnostic page ~~or the Array Control diagnostic page~~.

The unrecoverable condition bit (UNRECOV) shall be set to one if if one or more unrecoverable conditions (see 3.1.40) have been detected or set in the enclosure. The UNRECOV bit shall be cleared when both the following conditions are met:

a) all unrecoverable conditions have been corrected in the enclosure; and

b) the application client has cleared any UNRECOV bit state that has been set using the Enclosure Control diagnostic page ~~or the Array Control diagnostic page~~.

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6.1.10 Array Control diagnostic page

[delete entire section]

6.1.11 Array Status diagnostic page

[delete entire section]

6.1.13 Short Enclosure Status diagnostic page

A SEND DIAGNOSTIC command transmitting an Enclosure Control, ~~Array Control,~~ String Out, or Threshold Out diagnostic page to an enclosure services process that reports the Short Enclosure Status diagnostic page shall be terminated with a CHECK CONDITION status. The sense key shall be set to NOT READY and the additional sense code shall be set to ENCLOSURE SERVICES FAILURE or UNSUPPORTED ENCLOSURE FUNCTION.

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6.1.15 Device Element Status diagnostic page

6.1.15.1 Device Element Status diagnostic page overview

The optional Device Element Status diagnostic page provides additional information about Device elements and Array Device elements.

The Device Element Status diagnostic page reports an OVERALL STATUS field for each TYPE DESCRIPTOR HEADER in the Configuration diagnostic page that defines a ~~device element~~Device element or Array Device element and an ELEMENT STATUS field for each of the ~~device elements~~Device elements or Array Device elements that have been allowed for by the corresponding NUMBER OF POSSIBLE ELEMENTS field.

Only ~~device elements~~ Device elements or Array Device elements are included in the Device Element Status diagnostic page. The ~~device~~ elements shall be in the same order as the ~~device~~ elements in the Enclosure Status diagnostic page.

The Device Element Status diagnostic page returns a device information descriptor for each of the device elements that have been allowed for by the NUMBER OF POSSIBLE ELEMENTS field in the Configuration diagnostic page. The device information descriptors shall be in the same order as the ELEMENT STATUS fields in the Enclosure Status diagnostic page.

7 Element definitions

7.1 Element definitions overview

Table 28 — Element type codes

Add:

17h Array Device, not defined, none, 7.3.x, 7.3,y

7.3.2 Device element ~~defined for Enclosure Control and Enclosure Status diagnostic pages~~

The Device element accesses information about a SCSI device in the enclosure. The format of the CONTROL INFORMATION field for a Device element ~~in the Enclosure Control diagnostic page~~ is defined in table 34.

Table 34 — Device element ~~for Enclosure Control diagnostic page~~control type diagnostic pages

The format of the STATUS INFORMATION field for a Device element ~~in the Enclosure Status diagnostic page~~ is defined in table 35.

Table 35 — Device element for ~~Enclosure Status diagnostic page~~status type diagnostic pages

7.3.3 Device element defined for Array Control and Array Status diagnostic pages

[delete entire section]

7.3.xx Array Device element [new section]

The Array Device element accesses information about a SCSI device in an enclosure that is being used in a storage array (e.g., a RAID controller). The mapping between the visual indicators associated with the Array Device element and the requests to set those indicators is vendor specific.

The format of the CONTROL INFORMATION field for an Array Device element is defined in table 1.

Table 1 — Array Device element control type diagnostic pages

Byte\Bit	7	6	5	4	3	2	1	0
0	COMMON CONTROL							
1	RQST OK	RQST RSVD DEVICE	RQST HOT SPARE	RQST CONS CHECK	RQST IN CRIT ARRAY	RQST IN FAILED ARRAY	RQST REBUILD/ REMAP	RQST R/R ABORT
2	ACTIVE	DO NOT REMOVE	Reserved			RQST REMOVE	RQST IDENT	Rsvd
3	Reserved				ENABLE BYP A	ENABLE BYP B	Reserved	

The COMMON CONTROL field is specified in 7.2.2.

The RQST OK (request OK) bit is set to request that the device okay indicator be turned on. The RQST OK bit is cleared to request that the device okay indicator be turned off.

The RQST RSVD DEVICE (request reserved device) bit is set to request that the reserved device indicator be turned on. The RQST RSVD DEVICE bit is cleared to request that the reserved device indicator be turned off.

The RQST HOT SPARE (request hot spare) bit is set to request that the hot spare indicator be turned on. The RQST HOT SPARE bit is cleared to request that the hot spare indicator be turned off.

The RQST CONS CHECK (request consistency check in progress) bit is set to request that the consistency check in progress indicator be turned on. The RQST CONS CHECK bit is cleared to request that the consistency check in progress indicator be turned off.

The RQST IN CRIT ARRAY (request in critical array) bit is set to request that the in critical array indicator be turned on. The RQST IN CRIT ARRAY bit is cleared to request that the in critical array indicator be turned off.

The RQST IN FAILED ARRAY (request in failed array) bit is set to request that the in failed array indicator be turned on. The RQST IN FAILED ARRAY bit is cleared to request the in failed array indicator be turned off.

The RQST REBUILD/REMAP (request rebuild/remap) bit is set to request that the rebuild/remap indicator be turned on. The RQST REBUILD/REMAP bit is cleared to request that the rebuild/remap indicator be turned off.

The RQST R/R ABORT (request rebuild/remap aborted) bit is set to request that the rebuild/remap abort indicator be turned on. The RQST R/R ABORT bit is cleared to request that the rebuild/remap abort indicator be turned off.

The ACTIVE (device activity indication) bit is defined in the Device element.

The DO NOT REMOVE bit is set to request that the device not be removed. When the DO NOT REMOVE bit is cleared, the device may be removed. The DO NOT REMOVE bit may control mechanical interlocks or visual indications that the device should not be removed.

The RQST REMOVE (request removal) bit is set to request that the device slot be prepared for the removal of a device. When the bit is cleared, the device slot takes no action to prepare for the removal of a device. The RQST REMOVE bit may control mechanical interlocks or visual indications that a device may be removed from the device slot.

The RQST IDENT (request identify) bit is set to request that the identify indicator be turned on. The RQST IDENT bit is cleared to request that the identify indicator be turned off.

The ENABLE BYP A (enable bypass A) bit is set to request that port A for that device be bypassed. When the ENABLE BYP A bit is cleared and there is no other cause for the port to be bypassed, the port bypass shall be disabled and the device shall be included on the device interface.

The ENABLE BYP B (enable bypass B) bit is set to request that port B for that device be bypassed. When the ENABLE BYP B bit is cleared and there is no other cause for the port to be bypassed, the port bypass shall be disabled and the device shall be included on the device interface.

The format of the status information field for an Array Device element is defined in table 2.

Table 2 — Array Device element for status-type diagnostic pages

Byte\Bit	7	6	5	4	3	2	1	0
0	COMMON STATUS							
1	OK	RSVD DEVICE	HOT SPARE	CONS CHK	IN CRIT ARRAY	IN FAILED ARRAY	REBUILD/ REMAP	R/R ABORT
2	APP CLIENT BYPASSED A	DO NOT REMOVE	ENCLOSURE BYPASSED A	ENCLOSURE BYPASSED B	Rsvd	RMV	IDENT	Rsvd
3	APP CLIENT BYPASSED B	Reserved			BYPASSED A	BYPASSED B	DEVICE BYPASSED A	DEVICE BYPASSED B

The COMMON STATUS field is specified in 7.2.3.

The OK bit is set to indicate that the device okay indicator is turned on. The OK bit is cleared to indicate that the device okay indicator is turned off.

The RSVD DEVICE (reserved device) bit is set to indicate that the reserved device indicator is turned on. The RSVD DEVICE bit is cleared to indicate that the reserved device indicator is turned off.

The HOT SPARE bit is set to indicate that the hot spare indicator is turned on. The HOT SPARE bit is cleared to indicate that the hot spare indicator is turned off.

The CONS CHECK (consistency check in progress) bit is set to indicate that consistency check in progress indicator is turned on, showing that the device is participating in an array consistency check activity. The CONS CHECK bit is cleared to indicate that the consistency check in progress indicator is turned off.

The IN CRIT ARRAY (in critical array) bit) is set to indicate that the in critical array indicator is turned on, showing that the device is participating in an array which would be degraded or become unavailable if the device were removed. The IN CRIT ARRAY bit is cleared to request that the in critical array indicator be turned off.

The IN FAILED ARRAY bit is set to indicate that the in failed array indicator is turned on, showing that the device is a member of an array that has failed. The IN FAILED ARRAY bit is cleared to indicate that the in failed array indicator is turned off.

The REBUILD/REMAP bit is set to indicate that the rebuild/remap indicator is turned on, showing that the device is participating in a rebuild or remap of the array contents. The REBUILD/REMAP bit is cleared to indicate that the rebuild/remap indicator is turned off.

The R/R ABORT (rebuild/remap abort) bit is set to indicate that the rebuild/remap abort indicator is on, showing that a rebuild or remap of the array contents has been unsuccessfully terminated. The R/R ABORT bit is cleared to indicate that the rebuild/remap abort indicator is turned off.

If the DO NOT REMOVE bit is set, it indicates that mechanical interlocks or visual signals are present and activated to indicate that a device should not be removed. If the DO NOT REMOVE bit is cleared, it indicates that mechanical interlocks or visual signals are not present or not activated, indicating that a device may be removed.

The RMV (remove) bit is set to indicate that the device slot has been prepared for the removal of a device and that appropriate indicators are turned on. The RMV bit is cleared if the device cannot be removed from the device slot or if the RQST REMOVE control bit is not implemented.

The IDENT (identify) bit is set to indicate that the identify indicator is on, and that the enclosure is providing a visual indication of the device's location. The IDENT bit is cleared when the RQST IDENT control bit is cleared or not implemented.

The APP CLIENT BYPASSED A bit, APP CLIENT BYPASSED B bit, ENCLOSURE BYPASSED A bit, ENCLOSURE BYPASSED B bit, BYPASSED A bit, BYPASSED B bit, DEVICE BYPASSED A bit, and DEVICE BYPASSED B bit are defined in the Device element.

7.3.15 Key Pad Entry ~~Device~~ element

[Global change: To avoid confusion, remove Device from the name of this element everywhere.]

A.3 Configuration diagnostic page using sub-enclosure identifiers

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The TYPE DESCRIPTOR HEADER field indicates the element type being described, the number of such elements, the sub-enclosure where the elements are located, and the length of an optional text describing the element type. The format of the TYPE DESCRIPTOR HEADER is shown in table A.3. The elements of an enclosure shall be listed in the same order in:

a) the Configuration diagnostic page;

b) the type descriptor text of the Configuration diagnostic page;

c) the Enclosure Control and Enclosure Status ~~and Array Status~~ diagnostic pages;

~~d) the Enclosure Control and Array Control diagnostic pages; and~~

e) the Threshold In and Threshold Out diagnostic pages.